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EQUIVALENT EXPRESSIONS OF WIND FORCE.

THERE is probably no branch of Meteorology for which so many tables have been given, as for the conversion of the various wind scales into terms of one another. Having been frequently asked to epitomize and analyse them, I have lately done so with a most unsatisfactory result. I have found among the books on my own shelves at least a dozen tables, scarcely two of which are in exact accordance, while several have one or more numerical errors, and none agree in the names to be assigned to the various forces. For these reasons I have abandoned my original intention of placing them all in juxtaposition, and drawn up the following short table, which, it is hoped, will suffice for all ordinary purposes. I desire, however, in the first place, to lodge a protest against the possibility of obtaining any *simple* rule for the conversion of velocity into pressure, and *vice versa*; because the momentum of a body varies with its density: hence, if the barometer be at, say 28 inches, the pressure of any wind will be less than if the barometer were at 30 inches, the velocity in each case being the same, since each cubic foot of air would weigh about 36 grains more then, than at 28 inches.

It is a pity that two estimation scales (0—6 and 0—12) have been introduced; but it seems impossible to displace either, since each has its advantages: 0—12 is so generally used at sea, and has been so associated with the sails, &c., a ship can carry, that its displacement is undesirable; and the land scale 0—6 is very good, because, by squaring the numbers, we obtain directly the pressure in pounds per square foot. These, then, are the advantages of each, and seem such as to render it probable that Meteorologists will long have to endure the confusion arising from uncertainty as to which scale has been used.

RULES FOR CONVERSION IN CASES NOT GIVEN IN THE TABLES.

Lind's Gauge into pounds per square foot. — Multiply the height of water-column in inches by 5·2, and the result will be the equivalent pressure in lbs.; *e.g.*,—If Lind shews 3·8 inches, then 3·8 × 5·2 = 19·76lbs.

Lind's Gauge into miles per hour.— Proceed as before, and take the equivalent in miles from Table II.; *e.g.*—Lind 3·8 × 5·2 = 19·76lbs., which again (Table II.) equals a velocity of 63 miles per hour.

Velocity into pressure.—This is very undesirable; but the Rule most generally adopted is—Multiply the square of the velocity in miles per hour by ·005; *e.g.*—42 miles per hour—then 42 × 42 = 1764 × ·005 = 8·81bs. per square foot.

GENERAL CONVERSIONS.—TABLE I.

ESTIMATION.		INSTRUMENTAL.			POPULAR DESCRIPTION.
Beaufort, or Nautical Scale.	Land Scale.	Lind's Gauge.	Pressure per sq. foot.	Velocity, per hour.	
0—12	0—6	inches.	lbs.	miles.	
0	0	0	0	0	Calm.
1	·5	·05	·3	8	Gentle breeze.
2	1·0	·19	1·0	14	Moderate ,,
3	1·5	·43	2·3	21	Fresh ,,
4	2·0	·77	4·0	28	Very fresh.
5	2·5	1·20	6·3	35	Strong.
6	3·0	1·73	9·0	42	High wind.
7	3·5	2·36	12·3	50	Moderate gale.
8	4·0	3·08	16·0	57	Gale.
9	4·5	3·89	20·3	64	Fresh gale.
10	5·0	4·81	25·0	71	Strong ,,
11	5·5	5·82	30·3	78	Storm.
12	6·0	6·92	36·0	85	Hurricane.

PRESSURE CONVERTED INTO VELOCITY.—TABLE II.

Pressure	Velocity	Pressure	Velocity	Pressure	Velocity	Pressure	Velocity	Pressure	Velocity
lbs.	miles.	lbs.	miles.	lbs.	miles.	lbs.	miles.	lbs.	miles.
·1	4	4	28	16	57	28	75	40	89
·2	6	5	32	17	58	29	76	41	91
·3	8	6	35	18	60	30	77	42	92
·4	9	7	37	19	62	31	79	43	93
·5	10	8	40	20	63	32	80	44	94
·6	11	9	42	21	65	33	81	45	95
·7	12	10	45	22	66	34	82	46	96
·8	13	11	47	23	68	35	84	47	97
·9	13	12	49	24	69	36	85	48	98
1·0	14	13	51	25	71	37	86	49	99
2·0	20	14	53	26	72	38	87	50	100
3·0	24	15	55	27	73	39	88		

NOTE.—It should perhaps be mentioned that the above tables have been computed on the assumptions (1) that a cubic-foot of water weighs 62.4lbs: (2) that the square-root of 200 times the pressure equals the velocity. This value has been most generally adopted, and is near the average of all the best tables.

WELLS, THEIR TEMPERATURE AND DEPTH.

IT is by no means easy to foresee the branches of water measurement which will yield the *most* useful results, but it is impossible to deny that long and well kept records of the depth at which the water stands and has stood in bygone years would be of great use. Obviously they afford our best test of the condition of the ceaseless underground streams, and give us a better measure of the rainfall penetrating the earth's surface than any percolating gauge ever devised. Careful observations should teach us the rate and amount of percolation through the different geological formations, and would, in all likelihood, lead to many unexpected and useful results.

Again, so far as we are aware, no observations on the temperature of well water have been published except in Scotland, and there we find no record of the depth of the water below the surface, on which obviously the range of its temperature largely depends.

Believing that these two points are worthy of careful watching, we submit the following *suggestions*, trusting that they may act as a basis on which explicit rules may be framed, and that they may be freely criticised.

(1.) *Depth of water.*—Probably the easiest plan will be to have tapes (like measuring tapes), with a small disc attached, which on reaching the water should both produce a ripple and a slight sound.

(2.) Should the well be *very* deep, and light deficient, a small hand-mirror would, perhaps, reflect sufficient light.

(3.) The most *convenient* mode of observing, and one that might readily be made self-recording, would be to have a float attached to a long iron rod, which would then rise and fall with the level of the water, and its height could be noted with the greatest ease.

(4.) The measurement must be from some permanent mark on the framework of the well, or other well-defined object. The height of this point above mean sea level should be ascertained if possible.

(5.) It should be measured at some *regular* time, as well as at such irregular ones as the observer may please; but the *regular* measurement should be when the well has been as little interfered with as possible. (*Query*, Would not every Monday morning be a good time?)

(6.) Until the plan is regularly arranged, observers should err by taking too many observations, and writing too copious remarks rather than otherwise.

(7.) *Temperature of the Water.*—Considerable care must be used in selecting a thermometer for this purpose, (should a sufficient number of observers desire it, special thermometers could *probably* be prepared for 10s. 6d. each), and with such, some interesting points might be cleared up. For example, the following table shows how closely the *mean* temp. of well water approaches the mean temperature of the air, though its *range* of temperature is infinitely less; hence the scale of a well-water thermometer must be rigorously correct between 35° and 55°, but need not probably pass those points. Every temperature record should state the depth from which the water is drawn, and the first should specify the geological formation.

(8.) The temperature should be ascertained by simply drawing a bucket of water, and stirring the thermometer in it until it ceases to vary. This is believed to be far preferable to lowering a thermometer into the water, as it is liable to change between leaving the water and reaching the observer. Where a pump is affixed, it is probable that after pumping a bucket or so, the water would have the true well temperature, and a thermometer held in the spout would show it correctly.

TEMPERATURE OF WELLS IN SCOTLAND, 1864.

	Sandwick.		Arbroath.		Barry.		Otter House		Smeaton.		E. Linton.		Thurston.		Cargen.	
	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.	Air.	Well.
Jan. ...	38·5	46·0	37·6	47·0	36·3	44·7	36·5	45·7	35·6	45·4	37·0	48·0	35·0	46·4	36·0	47·8
Feb. ...	34·6	45·7	35·5	46·0	35·3	43·7	32·8	44·9	33·7	45·6	34·2	48·0	33·3	45·1	34·8	48·1
Mar....	37·0	44·7	39·2	46·5	38·6	42·0	37·0	44·8	38·3	45·0	40·4	48·0	37·4	45·5	39·4	47·9
April..	44·5	44·9	46·9	46·2	46·5	43·2	45·3	45·6	47·6	46·1	47·6	48·0	45·2	45·3	47·4	47·8
May ...	46·6	45·4	50·2	46·5	50·2	45·7	50·7	46·5	51·4	46·8	49·6	49·0	48·8	46·1	52·4	47·9
June...	51·2	45·7	56·0	47·0	55·0	46·4	53·2	47·7	55·4	47·8	55·0	48·0	52·9	45·5	54·8	48·0
July ...	54·2	46·6	58·1	47·7	57·1	48·2	56·4	48·6	58·0	47·6	57·6	49·0	54·9	45·9	60·3	48·0
Aug....	52·6	47·5	56·5	48·5	55·7	49·2	53·0	48·8	56·0	47·8	56·0	49·0	53·8	45·9	56·4	48·0
Sept ...	52·0	47·1	54·0	48·5	53·8	49·2	51·3	48·0	53·6	47·6	54·3	49·0	52·0	46·0	54·2	48·0
Oct. ...	45·9	47·0	48·1	48·5	47·6	49·2	44·4	47·2	46·0	47·6	46·4	49·0	45·4	46·2	48·1	48·0
Nov. ..	43·4	46·4	42·2	48·0	41·4	47·8	39·6	46·3	40·6	48·0	41·7	49·5	40·5	45·4	42·0	48·1
Dec....	41·7	46·0	40·7	46·5	39·8	46·7	38·3	45·6	39·5	47·6	40·2	49·8	39·2	45·9	40·2	48·1
Mean..	45·0	46·1	47·1	47·2	46·4	46·3	44·9	46·6	46·3	46·9	46·7	48·7	44·9	45·8	47·2	48·0
Max...	54·2	47·5	58·1	48·5	57·1	49·2	56·4	48·8	58·0	48·0	57·6	49·8	54·9	46·4	60·3	48·1
Min....	34·6	44·7	35·5	46·0	35·3	42·0	32·8	44·8	33·7	45·0	34·2	48·0	33·3	45·1	34·8	47·8
Range.	19·6	2·8	22·6	2·5	21·8	7·2	23·6	4·0	24·3	3·0	23·4	1·8	21·6	1·3	25·5	·3

RAINFALL IN MARCH, 1866.

Div.		STATIONS. [The Roman numerals denote the division of the Annual Tables to which each station belongs.]	Height of Gauge. Above Ground	Above Sea Level.	Depth of Rain. Total Fall.	Difference from average 1860–5	Greatest Fall in 24 hours. Depth.	Date.	Days on which ·01 or more fell.
			ft. in.	feet.	inches.	inches.	inches.		
I.	ENGLAND.	Camden Town	0 6	100	1·69	— ·39	·41	23	17
II.		Staplehurst (Linton Park)	0 6	200 ?	2·27	— ·22	·54	24	17
,,		Selborne (The Wakes)	4 0	500 ?	2·72	+ ·12	·79	23	12
III.		Hitchen	2 0	240	1·28	— ·89	·42	24	13
,,		Banbury	7 0	345	1·33	— ·88	·23	23	17
,,		Wisbech	0 6	10	·95	...	·19	17	13
IV.		Bury St. Edmunds (Culford)	1 2	...	1·30	— ·90	·26	17	11
V.		Calne	0 11	250	2·01	...	·51	23	13
,,		Plymouth (Goodamoor)	0 2	580	4·42	— ·74	·76	15	18
,,		Barnstaple	0 6	31	3·23	+ ·08	·61	23	15
,,		Taunton (Fulland's School)	1 4	...	3·44	...	1·16	24	10
VI.		Shrewsbury (Highfield)	5 6	200	1·42	— ·72	·31	13	11
,,		Tenbury (Orleton)	0 9	200	2·31	— ·11	·45	23	19
VII.		Leicester (Wigston)	0 6	220	1·27	— ·84	·24	17	15
,,		West Retford	0 6	50	1·22	— ·72	·27	6	17
,,		Derby	5 0	180	1·72	— ·53	·41	17	18
VIII.		Manchester	2 7	106	2·17	— ·46	·35	17	13
IX.		York	0 6	50	1·35	— ·64	·44	7	15
,,		Skipton (Arncliffe)	3 0	750	3·60	—1·21	·74	6	13
X.		North Shields	1 0	124	2·47	+ ·12	·53	6	22
,,		Borrowdale (Seathwaite)	1 0	422	13·05	— ·35	3·30	24	17
XI.	WALES.	Abercarn	1 3	450	3·84	...	·76	23	14
,,		Haverfordwest	2 0	60	5·39	+1·94	1·70	24	19
,,		Rhayader (Cefnfaes)	2 0	880	3·93	+ ·09	·61	17	17
,,		Llanberis (R. Victoria Hotel)	1 0	370	5·91	...	1·83	23	14
XII.	SCOTLAND.	Dumfries	0 5	70	2·03	— ·95	·51	28	13
,,		Hawick (Silverbut Hall)	4 0	512	1·93	...	·28	26	18
XIV.		Ayr (Auchendrane House)	2 3	94	2·13	—1·60	·44	23	14
XV.		Otter House	0 6	130	4·43	— ·21	1·03	24	16
,,		Fort William	0 8	20	3·68	...	1·01	29	18
XVI.		Leven (Nookton)	0 6	80	2·02	— ·05	·67	6	18
,,		Stirling (Deanston)	0 0	130	2·75	— ·78	·50	23	20
,,		Logierait	1 0	250	4·31	...	1·12	23	16
XVII.		Ballater	0 10	656	7·04	...	1·50	6	18
,,		Aberdeen	4 8	115	3·21	...	·71	6	20
XVIII		Inverness (Culloden)	3 0	104	...	...	...	...	...
,,		Portree	0 4	60	6·40	—2·64	1·24	5	21
,,		Loch Broom	0 8	48	3·73	...	·51	29	27
XIX.		Helmsdale	1 0	34	2·13	...	·23	12	22
,,		Sandwick	2 0	78	3·08	— ·25	·33	30	23
XX.	IRELAND.	Cork	6 0	65	3·98	...	1·29	14	18
,,		Waterford	4 0	60	3·51	+ ·62	·72	14	18
,,		Killaloe	5 0	128	3·85	— ·47	·98	23	22
XXI.		Portarlington	9 0	236	2·92	— ·39	·85	23	24
,,		Monkstown	0 6	100	4·15	+1·57	1·17	23	19
XXII.		Galway	6 0	25	3·29	...	·50	14	25
,,		Bunninadden (Doo Castle)	1 0	...	2·93	...	·59	23	23
XXIII		Bawnboy (Owendoon)	1 3	218 ?	3·29	...	·68	23	22
,,		Waringstown	0 4	191	3·08	...	·65	23	21
,,		Strabane (Leckpatrick)	0 5	260	2·64	...	·52	23	25

+ Shows that the fall was above the average ; — that it was below it.

METEOROLOGICAL NOTES ON THE MONTH.

[ABBREVIATIONS.—Bar. for Barometer; Ther. for Thermometer; Max. for Maximum; Min. for Minimum; T for Thunder; L for Lightning; and T S for Thunderstorm.]

ENGLAND.

CAMDEN TOWN.—Snow on 1st, 8th, 10th, 13th, and 22nd, but in very small quantities, except on 8th (for description see "Meteorological Magazine," No. 2, page 18.) The 15th was remarkable for the extreme dryness of the air; lunar halo on 27th. Max. 65°·2 on 29th, in sun 106°·2 on 30th; Min. 22°·5 on 1st, and on grass 14°·2 on the same day.

LINTON PARK.—Less wind than usual, except on 23rd, when we had a gale at night, blowing down several trees. Snow on 7th, 8th, 13th, and 21st. Max. 65° on 29th; min. 22° on 1st.

SELBORNE.—Snow on 1st, 4th, 5th, 15th, 21st; hail on 9th, at 5 p.m., also on 24th. Aurora on 6th, 9th, 16th, 19th. Max. 57° on 29th; min 17°·5 on 1st.

WISBECH.—Dull showery month; gale 15½ lbs. on 23rd at 9 p.m.; snow on 13th at 7 p.m.; hail on 7th, and at noon on 21st. Aurora on 18th, at 10 p.m. Solar halos on 18th and 23rd. Max. bar. 30·418 on 10th; min. 29·024 on 24th. Max. temp. 63°·5 on 29th; min 21°·1 on 1st.

CULFORD.—Rather less wind than is usual in March, except that on the night of the 22nd (23rd ?) when it blew quite a hurricane, unroofing buildings, and blowing down chimneys. Max. 61° on 29th; min. 23° on 1st.

GOODAMOOR.—Frost on 18 mornings; tremendous gale all the afternoon of 23rd from S.E. through S. to W. and N.W., with much rain; snow on 1st, 7th, 8th, & 13th.

BARNSTAPLE.—Max. bar. 30·42; min. 28·97 in. Max. temp. 60°·5 on 27th; min. 19°·0 on 1st.

ORLETON.—Generally cloudy, dull, and cold; snow at 6 p.m. on 4th, also on 5th, 6th, 13th, 15th, 21st. On 18th, distant T in S. and W. Violent wind and rain on 23rd.

WIGSTON.—Mean temp. below the average; the rainfall was also below it, although the month was damp throughout. Very stormy on 23rd, especially at night.

WEST RETFORD.—A dull, cold month, with occasional snow showers. High wind on 23rd; bar. 28·77. Frost on 18 nights. Min. 15° on 1st; max. 65° on 29th.

DERBY.—No high winds; wet, cheerless, and unfit for gardening operations.

MANCHESTER.—With the exception of the last week, the mean temp. was generally below the average.

YORK.—Snow on 4th, 6th, 13th, and 22nd.

ARNCLIFFE.—Early part of month very cold, latter part very wet; heavy snow on 22nd. Min. 16° on 5th, 18° on 1st, and 20° on 7th.

N. SHIELDS.—Barometer and thermometer low throughout; snow on 12 days; hail on 21st and 22nd; lunar halo, 27th.

SEATHWAITE.—Early part of the month dry and frosty, with strong E. winds; last 10 days very wet and stormy, with variable winds. Rain over an inch on 5 days, over two inches on 2 days, viz., 27th=2·48, and 24th=3·30 in.

WALES.

ABERCARN.—A dry, cold month on the whole, and generally calm, excepting a heavy storm on 23rd; snow on 8 days.

HAVERFORDWEST.—March came in like a lion; snow and severe frost; thermometer as low as 18°·5 at sunrise on 1st; weather cold and gloomy, with snow every night until 13th, afterwards milder (though still very wintry) and much wetter, and at times very stormy, especially about 15th and 16th, and 23rd and 24th; the latter being the most severe storm this year. Rainfall above the average, temperature below it. The land so wet that farming operations are much retarded.

CEFNFAES.—Snow on 6th, 13th, 14th and 31st; T on 18th; S.E. gale on 23rd. Last three days very mild and spring-like, vegetation coming rapidly forward.

SCOTLAND.

DUMFRIES.—March opened with the rigour of winter; on morning of 5th, temp. down to 19°, the lowest point during the winter; after 10th the frost broke. Snow on 1st, 4th, 6th, (five or six inches deep), 13th, 15th, 20th, and 23rd. Close of month mild and showery, vegetation progressing, but snow still on the hills.

HAWICK.—Snow and frost all the first fortnight; T in afternoon of 12th.

AUCHENDRANE.—A cold dry month; grass min. below freezing on 23 nights. Max. 57° on 30th, min. 18° on 2nd. Max. barometer 30·531 on 10th; min. 28·756

on 24th. Heavy gale from S. on 23rd, but of short continuance, and not so severe as in the south of England.

OTTER HOUSE.—Although there was frost on 18 nights there was none in the day; the temperature gradually increased during the month. Daffodils are in full bloom, and the poplar nearly in leaf. [Now, April 10th, ten days after the date of the above report, more than 300 miles south of Otter House, and within the warming influence of the metropolis, no poplars yet show even leaf buds, thus showing how mild a winter residence is afforded by the Western Isles of Scotland.—ED.]

FORT WILLIAM.—Snow on 6th and 22nd. Prevailing wind N.E. until 26th, afterwards S. and S.W.

NOOKTON.—Weather variable; snow and night frosts alternating with mild spring-like weather. Min. temp. 21° on 5th; max. 58° on 29th. Snow on 1st, 6th, 7th, and 8th (with hail), daily from 19th to 23rd. Breeze at 8 p.m. on 23rd.

DEANSTON.—Snow or hail on nine days; frequent frosts; Max. 55°·9 on 29th; min. 12°·5 on 22nd.

LOGIERAIT.—A very stormy month—much snow and hard frosts till within the last week. In the last few days spring flowers and early budding trees have made much progress, but agricultural work is very far behind.

BALLATER.—A very stormy month, the fall of snow (averaging 2ft. 6in. on 7th), being greater than for at least a dozen years, while the temperature, on several occasions, was very low, falling on 5th to 3°·5, (28°·5 below freezing). There were strong N.E. gales on 3rd and 12th. During the last week the weather became much milder, and the snow melting on the hills caused the streams in the neighbourhood to be much flooded.

ABERDEEN.—More or less snow, sleet, or hail on twelve days; but on no day did the fall exceed three-quarters of an inch. Max. 60° (in sun 107°·9) on 28th. Min. 18°·5 (on grass 9°) on 5th. Max. bar. 30·363 on 10th; min. 28·909 on 24th. Aurora on thirteen nights—no severe gale.

PORTREE.—A cold wet month: agricultural operations very backward, the ground being soaked with water. No cattle disease in the island. Snow on nine days. Solar halo on 25th, at 6 p.m.—Lunar halos on 20th, 25th, and 28th. Max. temp. 54° on 28th; min. 18°·9 on 5th; on grass 15°.

LOCHBROOM.—Nothing could exceed the changeableness of the past month, but frost and snow have been its prevailing characteristics.

SANDWICK.—Wet cold month; in fact, while the previous months this winter were uncommonly mild, February and March have been severe, vegetation and agricultural operations are therefore backward. Alternate snow and thaw several days. Snow two inches deep on 19th. Aurora on 7th and 8th; lunar halo on 25th, at 10.30 p.m. Max. 54°·2; min. 25°.

IRELAND.

KILLALOE.—A cold month, ground so wet as to delay sowing oats and planting potatoes; snow on 6 days; storm from S on night of 22nd, and all day on 23rd; violent wind and rain at 6 p.m. Barometer 28·28 inches.

PORTARLINGTON.—A very severe month.

GALWAY.—Aurora on 18th.

DOO CASTLE.—Although the quantity of rain this month is less than might be expected from the number of "days," yet the land being so thoroughly saturated by the three previous months' wet, without any lengthened interval of drying, its effects are those of a very wet month; farming operations are very backward.

OWENDOON.—A very severe month, with frequent piercing winds; spring work much retarded. Great storm on 23rd; T on 26th.

WARINGSTOWN.—Earlier part of month cold and wintry; latter part so broken as seriously to impede farming operations, which are consequently very backward. Frost on grass on 20 nights. On the night of 1st, the grass thermometer fell to 12°, much lower than on any other occasion this season. Heavy gale on evening of 23rd.

LECKPATRICK.—Cold month; the great rainfall at times rendering the soil too wet for sowing. Great fall of the barometer from 9 a.m. 22nd to 10 p.m. on 23rd, during which 37 hours it fell 1·3 inch. Gale from S.W. veering to N.E. Thermometers out of order; the porcelain scales had only been fastened with plaster of Paris, and became detached by the frost.

Latitude and Longitude of the 50 Stations whence monthly returns are published.

Stations.	Latitude.	Longitude.	Stations.	Latitude.	Longitude.
Camden Town ...	51°33′ N	0° 8′ W	Dumfries	55° 5′ N	3°36′ W
Linton Park.....	51 13 N	0 31 E	Hawick	55 26 N	2 46 W
Selborne	51 6 N	0 56 W	Auchendrane Ho	55 27 N	4 37 W
Hitchen	51 57 N	0 17 W	Otter House ...	56 1 N	5 20 W
Banbury	52 4 N	1 20 W	Fort William ...	56 47 N	5 7 W
Wisbech	52 40 N	0 10 E	Nookton	56 12 N	3 0 W
Culford	52 17 N	0 42 E	Deanston	56 11 N	4 4 W
Calne.....	51 27 N	1 59 W	Logierait	56 38 N	3 41 W
Goodamoor	50 25 N	4 0 W	Ballater	57 4 N	3 5 W
Barnstaple	51 4 N	4 4 W	Aberdeen	57 9 N	2 6 W
Taunton	51 1 N	3 6 W	Culloden	57 30 N	4 7 W
Shrewsbury	52 42 N	2 46 W	Portree	57 24 N	6 13 W
Orleton	52 18 N	2 27 W	Loch Broom ...	57 47 N	5 5 W
Wigston	52 35 N	1 6 W	Helmsdale	58 7 N	3 38 W
W. Retford	53 19 N	0 58 W	Sandwick	59 3 N	3 17 W
Derby	52 55 N	1 28 W	Cork	51 54 N	8 30 W
Manchester	53 28 N	2 17 W	Waterford	52 16 N	7 6 W
York	53 58 N	1 5 W	Killaloe	52 48 N	8 26 W
Arncliffe	54 9 N	2 6 W	Portarlington ..	53 10 N	7 10 W
N. Shields	55 0 N	1 26 W	Monkstown ...	53 17 N	6 8 W
Seathwaite	54 30 N	3 12 W	Galway	53 17 N	9 3 W
Abercarn	51 39 N	3 6 W	Doo Castle	54 3 N	8 38 W
Haverfordwest ...	51 48 N	4 55 W	Owendoon	54 6 N	7 44 W
Cefnfaes.....	52 18 N	3 32 W	Waringstown ...	54 26 N	6 18 W
Llanberis	53 6 N	4 7 W	Leckpatrick ...	54 53 N	7 26 W

NOTE.—The above table has been compiled to facilitate the ready identification of the Stations, not with any pretension to rigorous accuracy; though it is hoped few of the positions are more than a mile or two in error, it is probable that some are, since few maps agree closely in the position of remote parts of the British Isles.

ON FIXING RAIN GAUGES.

HAVING noticed that the returns from one station were below all around it, I requested one of the observers in the neighbourhood to call and consult with the offending registrar as to the cause. He reported it a good gauge, but merely stuck in the hole of an old tree so loosely that any strong wind would blow it out of the perpendicular; in fact it was 15° or 20° out, when visited. The report continues:—

I fancy there may be more of your correspondents than you are aware of, who are unconscious of the absolute necessity of keeping their gauges perfectly *level* and *steady*, in order to obtain a correct account. Nor, I fancy, are they aware of the nicety required in measuring the rain in the graduated glass. For few are able to hold it perpendicular, and unless one does so I find that the difference of a hundredth at least may easily be occasioned. Then, again, an error may easily be made through not calculating by the proper surface of the water; for, owing to the attraction of the glass, the edge of the water is always nearly a hundredth higher than the centre, which is the *true level*; accordingly, in the use of the same gauge, one person may, in every registration, make the amount so much more or less than another, and no uniformity is arrived at. I find upon experiment that in Casella's gauges the calculations are made by the centre of the surface and not the edge—at least so it is in my glass measurer, and probably in all. If so, it would be well that all who use that gauge should calculate by the same rule.

RECENT PUBLICATIONS.

Meteorological Diagram, showing the daily elements throughout the year 1865. By C. O. F. CATOR, M.A. London : Stanford.

WE gladly welcome this splendid lithograph, and rejoice that Mr. Cator has produced a better diagram for 1865 than he did for 1864, since to the previous copious details he has added the weekly price of wheat ; true, this is affected by other causes as well as atmospheric fluctuations, yet none could look at this diagram without noting instantly how the rain in August sent the price up, and how rapidly it fell under the influence of the brilliant September of 1865. The mutual relations of temperature, pressure, wind, rain, mortality, &c., are most clearly shown, and we part with this handsome sheet with the suggestion that rather more prominence should be given to the barometer, and with the hope that Mr. Cator may delineate with equal accuracy the meteorology of many years to come.

A Treatise on Meteorology : the Barometer, Thermometer, Hygrometer, Rain Gauge and Ozonometer, with rules and regulations to be observed for their correct use. By ALBERT J. T. MORRIS. Edinburgh : R. Grant and Sons.

Mr. MORRIS describes his treatise as "specially adapted for the use of amateurs," and we envy those who learn their first lessons in Meteorology from his pleasantly-written pages, which are replete with information. We regret that Mr. Morris has adopted the *approximate* rule for barometer corrections given by Admiral FitzRoy in his daily Weather Reports, because we do not think observers would have found it more trouble to use a regular table, and thereby ensure correctness, and on one or two other points we should have liked stricter rules laid down ; still we have not yet seen any treatise on Meteorology so suitable for an amateur observer as Mr. Morris's.

Annual Report of the Royal National Lifeboat Institution. Published at the Office, John Street, Adelphi.

THOUGH not strictly Meteorological, the publications of this Society (especially their quarterly journal, "The Lifeboat") so frequently contain communications on Meteorology that that reason is superadded to the universal desire of helping forward their noble work in inducing us to wish them all success. It is very gratifying to see that though their expenses last year were nearly £30,000, their receipts were even larger : long may the balance continue on that side ; but that such may be the case *all* must remember (what treasurers of societies never forget) that an ample supply of new subscribers must be enlisted each year to take the place of those annually removed by death.

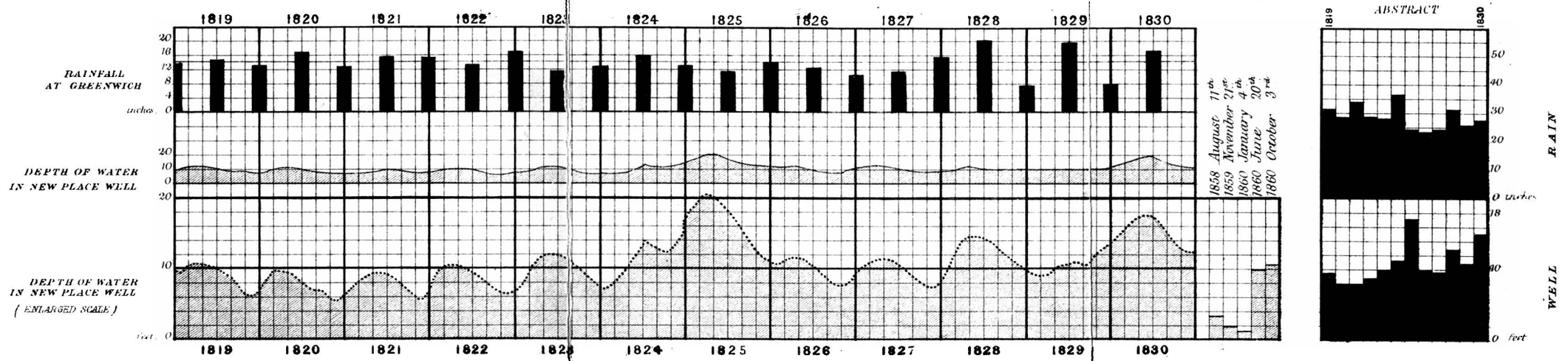
Proceedings of Literary and Philosophical Society of Manchester, Vol. 5, *No.* 12, contains a most interesting analysis by Mr. Baxendell of the first 8 months' records of Rev. J. C. Bates's quarter-hourly self-registering rain-gauge. Owing to the short period during which the instrument has been at work, there is little doubt that the results will require subsequent modification ; but with this introductory remark, and looking to the interest attending this first determination of the relative rainfall in different hours of the day, we annex with pleasure the results Mr. Baxendell has deduced :—

Daily Rainfall.		Oscillations of Magnetic Needle.*
Principal maximum at	8½ a.m.	10 a.m.
Secondary ,,	8 p.m.	7½ p.m.
Principal minimum	2 p.m.	1 p.m.
Secondary ,,	1½ a.m.	3 a.m.

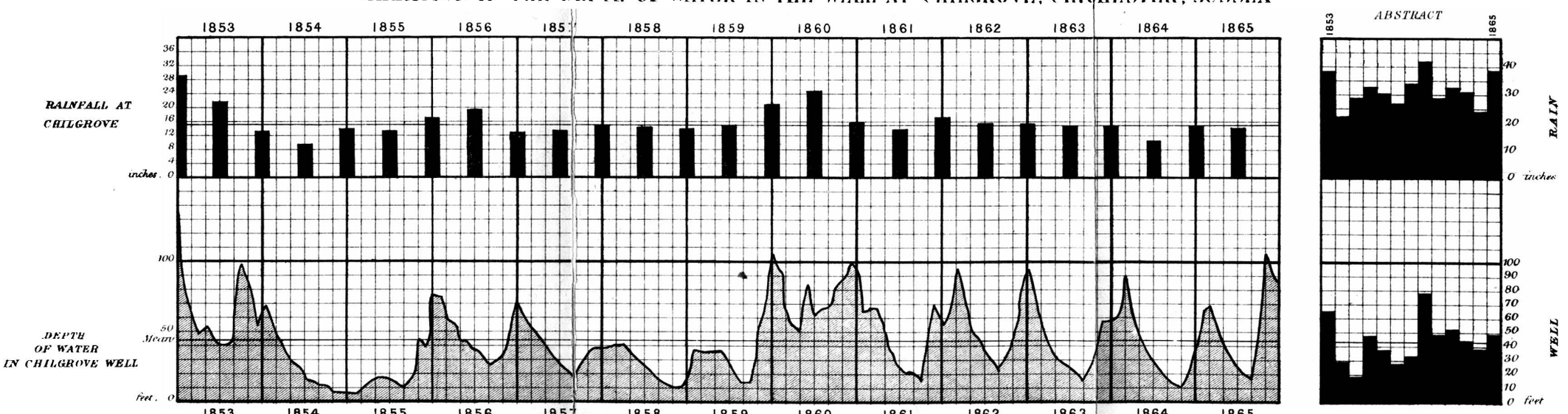
* Mean of ten years' declination at Greenwich, westerly deviation being taken with a negative sign.

In addition to the similarity in the daily curves of rainfall and magnetic oscillations noted above, we may mention, as Mr. Baxendell has done, the similarity which the former presents to the barometric curve, save that the rainfall max. and min. precede the barometric by about two hours.

VARIATION IN THE DEPTH OF WATER IN THE WELL AT NEW PLACE, HARTLIP, SITTINGBOURNE, KENT.



VARIATION IN THE DEPTH OF WATER IN THE WELL AT CHILGROVE, CHICHESTER, SUSSEX



In the above curves the black line separating each year is held to represent January, each succeeding line and space the several months: the rain blocks show the total fall during the six summer and six winter months, and are therefore placed on the lines of January and July